LADYZHENSKAYA, K.I.; KHUDAYKULOV, S.M.

Spore-bearing of Ricciocarpus natans (L.) Corda. Bot.mat.Otd.
spor.rast. 11:182-186 Ja '56. (MLRA 9:11)
(Hepaticae)

LADYZHENSKAYA, K.I.

Riccia crustata Trav., a new liverwort species in the U.S.S.R.; according to Levitskii. Dokl. AN BSSR. 3 no.6:270-274 Je '59. (MIRA 12:10)

1. Predstavleno akademikom AN BSSR V.F. Kuprevichem. (Hepaticae)

LADYZHENSKAYA, K.I.

Riccia crustata Trab. in the liverwort flora of the U.S.S.R. Bot. mat. Otd. spor. rast. 13:274-281 '60. (MIRA 13:7)

(Naurzum Preserve--Hepaticae)

LADYZHENSKAYA, K.I.

Investigation of the spores of Hepaticae. Bot. mat. Otd. spor. rast. 14:243-252 Ja'61.

New species Riccia lamellosa Raddi and papillosa Moris in the U.S.S.R. Bot. mat. Otd. spor. rast. 14:252-262 Ja'61.

(MIRA 17:2)

LADYZHENSKAYA, K.I.

Fossombronia longiseta Aust., a liverwort found in the U.S.S.R. for the first time. Bot. mat. Otd. spor. rast. 16:165-167 '63. (MIRA 16:10)

LADYZHENSKAYA, K.I.

Materials on the mosses of the U.S.S.R. Part 3. A new genus of liverworts (Lepicolea Dum.) in the U.S.S.R. Dokl. AN BSSR 7 no.4:270-273 Ap '63. (MIRA 16:11)

1. Botanicheskiy institut AN SSSR imeni Komarova, Leningrad. Predstavleno akademikom AN BSSR V.F. Kuprevichem.

LADYZHENSKAYA, K.I.

Materials on the bryoflora of the U.S.S.R. Pt. 4. A new genus of the liverwort Neohattoria Kamin. Dokl. AN BSSR 7 no.10:708-710 O '63. (MIRA 16:11)

1. Botanicheskiy sad AN SSSR, Leningrad. Predstavleno akademikom AN BSSR V.F. Kuprevichem.

LADYZHENSKAYA, K. I.

"On evolution in Bryophyta on the basis of apospory."

report submitted for 10th Intl Botanical Cong, Edinburgh, 3-12 Aug 64.

AS USSR, Leningrad

LADYZHENSKAYA, N.V. [Ladyzhens'ka, N.V.]

Resistance to brown rust in spring wheat leaves as related to their position on the stem. Trudy Inst. gen. i sel. AN URSR 5:63-72 '58. (MIRA 11:9)

(Wheat--Disease and pest resistance) (Uredineae)

LADYZHENSKAYA, N.V.; GULIDOVA, L.A.; TIMOSHENKO, Z.F. (Dzerzhinsk, ~~Gor'kovskoy~~ obl.); ZEREKIDZE, R.I.

From the practices in the use of poisonous chemicals. Zashch. rast. ot vred. i bol. 9 no.3:24-25 '64. (MIRA 17:4)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut khimicheskikh sredstv zashchity rasteniy (for Ladyzhenskaya, Gulidova).
2. Zaveduyushchiy otdelom zashchity rasteniy Gruzinskoy selektsionno-opytnoy stantsii Vsesoyuznogo instituta kukuruzy, Mtskhetskiy rayon (for Zerekidze).

LADYZHENSKAYA, O. A.

Ladyženskaya, O. A. On the uniqueness of the solution of Cauchy's problem for a linear parabolic equation. Mat. Sbornik N.S. 27(69), 175–184 (1950). (Russian)

A. N. Tychonoff [Rec. Math. [Mat. Sbornik] (1) 42, 199–216 (1935)] has considered unbounded solutions of the Cauchy problem for the heat equation, and proved that: (1) if the continuous solution $U(x, t)$ of the heat equation $\partial U/\partial t = \partial^2 U/\partial x^2$ has continuous derivatives appearing in the equation on the infinite strip $0 < t < t_0$, it grows so slowly that

$$\max_{0 \le t \le t_0} |U(x,t)| \le C e^{Cx^2},$$

and U vanishes for $t = 0$, then U vanishes throughout the strip; (2) for any $\epsilon > 0$ there exists a nontrivial solution $U(x, t)$ of the heat equation, satisfying all the hypotheses of (1), save that the growth hypothesis is replaced by

$$\max_{0 \le t \le t_0} |U(x,t)| \le C e^{C_1 x^{2+\epsilon}}.$$

I. G. Petrovskiĭ [Bull. Univ. État, Moscou, Sect. A. 1, no. 7 (1938)] established that Cauchy's problem is well posed for bounded solutions of general linear parabolic systems whose coefficients depend on t, and raised the question of extending Tychonoff's results to these systems. The present paper contains an extension of (1) to the parabolic equation

$$\frac{\partial U}{\partial t} = \sum_{\sum_{i=1}^{n} k_i = 2p} a_{(k_1, \cdots, k_n)}(t) \frac{\partial^{2p} U}{\partial x_1^{k_1} \cdots \partial x_n^{k_n}},$$

the corresponding growth condition being

$$\max_{0 \le t \le t_0} |U(x,t)| \le C e^{C r^{2p/(2p-1)}(x)},$$

where $r(x) = (\sum_{i=1}^{n} x_i^2)^{\frac{1}{2}}$ and $x = (x_1, \cdots, x_n)$; and also an extension of (2) to the parabolic equation

$$\frac{\partial U}{\partial t} = (-1)^{p-1} \frac{\partial^{2p} U}{\partial x^{2p}}.$$

J. B. Dias (College Park, Md.).

Source: Mathematical Reviews, Vol 12 No. 9.

LADYZHENSKAYA, O. A

Ladyženskaya, O. On the solution of mixed problems for hyperbolic equations. Doklady Akad. Nauk SSSR (N.S.) 73, 647–650 (1950). (Russian)

Let n be a positive integer, and Ω be a bounded open set in $X=(x_1, \cdots, x_n)$ space. The author announces (under certain smoothness and growth restrictions on the coefficients of the equation) the following result: There exists one and only one real-valued function u with continuous second derivatives in Ω, satisfying the conditions

$$\frac{\partial^2 u}{\partial t^2}=\sum_{i,j=1}^{n}\frac{\partial}{\partial x_i}\left(a_{ij}(X)\frac{\partial u}{\partial x_j}\right)+\sum_{i=1}^{n}b_i(X)\frac{\partial u}{\partial x_i}+c(X)u-\varphi(X,t),$$

for $t\geqq 0$ and $X\varepsilon\Omega$; $u(X,0)=0$, $\partial u/\partial t(X,0)=0$, for $X\varepsilon\Omega$; for each $t\geqq 0$, u has the boundary value zero in the mean sense; i.e., $\lim_{r\to 0} r^{-1}\int_{S_r} u^2 d\Omega=0$, where S_r is a "boundary strip of width r"; and also $\int_\Omega(u^2+u_t^2+\sum_{i=1}^{n}u^2_{x_i})\,d\Omega$ exists for each $t\geqq 0$ and is bounded above on each finite interval $0\leqq t\leqq T$. The construction of the function u is carried out by first performing a Laplace transformation

$$v(X,\lambda)=\int_0^\infty u(X,t)e^{-\lambda t}dt,$$

and then dealing with the resulting equation for v by replacing it by a finite difference equation, using the methods of Courant, Friedrichs, and Lewy [Math. Ann. 100, 32–74 (1928)], and Sobolev [Rec. Math. [Mat. Sbornik] N.S. 2(44), 465–499 (1937)]. It is stated that when $n=2$ the solution $u(X,t)$ actually vanishes on the boundary.

J. B. Diaz (College Park, Md.).

Source: Mathematical Reviews, Vol 12 No. 5

LADYZHENSKAYA, O.

Ladyženskaja, O. On the method of Fourier for the wave equation. Doklady Akad. Nauk SSSR (N.S.) 75, 765–768 (1950). (Russian)

Let Ω be a domain in the $(x_1, \cdots, x_n)$-space, u_k $(k=1, 2, \cdots)$ the normalized eigenfunction of the differential equation $\Delta u + \lambda u = 0$ belonging to the domain Ω, the boundary condition $u=0$ and the eigenvalue λ_k. The series (1) $u(x_1, \cdots, x_n, t) = \sum (a_k \cos \lambda_k t + b_k \sin \lambda_k t) u_k$ is the formal solution of the wave equation $\Delta u = u_{tt}$ for the initial conditions $u = \phi_0$, $u_t = \phi_1$ and the boundary condition $u=0$. The author proves that the following conditions are sufficient for the uniform convergence of (1) and the series obtained from (1) by two term-by-term differentiations. The boundary surface S of Ω is a Lyapunov surface locally representable by $([\frac{1}{2}n]+4)$-times continuously differentiable functions. The eigenfunctions u_k have on $\Omega + S$ continuous derivatives of order $([\frac{1}{2}n]+3)$ and ϕ_j has continuous derivatives of order $([\frac{1}{2}n]+3)$ for $j=0$, $([\frac{1}{2}n]+2)$ for $j=1$. Moreover, ϕ_j and $\Delta^\nu \phi_j = 0$ on S for $1 \leqq \nu \leqq \frac{1}{2}([\frac{1}{2}n]+2)$ for $j=0$, for $1 \leqq \nu \leqq \frac{1}{2}([\frac{1}{2}n]+1)$ for $j=1$. Similar results are stated for the boundary condition $(\partial u/\partial n) + hu = 0$ on S. *L. Bers.*

Source: Mathematical Reviews, Vol 12 No. 8

LADYZHENSKAYA, O. A.

PA 193T45

USSR/Mathematics - Mixed Problem, Hyperbolic Equation Nov/Dec 51

"Concerning the Solution of the Mixed Problem for Hyperbolic Equations," O. A. Ladyzhenskaya

"Iz Ak Nauk SSSR, Ser Matemat" Vol XV, No 6, pp 542-562

Gives the sufficient conditions governing the applicability of the Laplace transformation for the soln of the mixed problem for linear hyperbolic eqs of the 2d order. As far as the authoress knows, this has been done for eqs and regions of only special form. The main results of this work have

193T45

USSR/Mathematics - Mixed Problem Hyperbolic Equation (Contd) Nov/Dec 51

been published in "Dok Ak Nauk SSSR" Vol LXXIII, No 4, 1950, pp 647-650. Submitted by Acad V. I. Smirnov 24 Oct 50.

193T45

GTRSPL No. 45

Ladyzhenskaya, O., The completeness of the elliptical operator. 723-5

Akademiya Nauk S.S.S.R., Doklady Vol. 79 No. 5, 1951

GTRSPL No. 45

Ladyzhenskaya, O., Integrals of hyperbolic equations, 925-7

Akademiya Nauk S.S.S.R., Doklady Vol. 79 No. 6 - 1951

LADYZHENSKAYA, O.

235T70

USSR/Mathematics - Mixed Problem 21 Jul 52

"Convergence of Fourier Series Which Define the Solution of the Mixed Problem for Hyperbolic Equations," O. Ladyzhenskaya, Leningrad State U imeni Zhdanov

"Dok Ak Nauk SSSR" Vol 85, No 3, pp 481-484

Investigates the nature of the convergence of the Fourier series u(X, t) which formally satisfies all the requirements posed by the conditions (boundary, initial, etc.) $u/_{t=o} = f(X)$, $u_t/_{t=o} = F(X)$ on a hyperbolic eq; and in this way clarifies when the sum of the series gives the soln of the problem

235T70

in a certain sense. Author reported case discussed here at a session of the Moscow Math Soc (see "Uspekhi Matemat Nauk" Vol 6, No 1 (41), 1951). The results of this report for a wave eq were published by author in "Dok Ak Nauk SSSR" Vol 75, No 6, 1950. Submitted by Acad V. I. Smirnov 22 May 52.

235T70

PA 227T59

LADYZHENSKAYA, O.

USSR/Mathematics - Mixed Problem, Finite Differences — 1 Aug 52

"Solving the Mixed Problem by Means of Finite Differences," O. Ladyzhenskaya

"Dok Ak Nauk SSSR" Vol 85, No 4, pp 705-708

Demonstrates several theorems governing the generalized soln of subject mixed problems by means of finite differences. Submitted by Acad V.I. Smirnov 22 May 52.

227T59

LADYZHENSKAYA, O.A.

Solution of the Cauchy problem for hyperbolic systems by the method of finite differences. Uch.zap.Len.un. no.144:192-246 '52. (MLRA 9:6)
(Differential equations, Partial) (Difference equations)

LADYZHENSKAYA, O. A.

PHASE I TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 314 - I

BOOK Call No.: QA342.L3

Author: LADYZHENSKAYA, O. A.
Full Title: COMPOSITE PROBLEM FOR A HYPERBOLIC EQUATION
Transliterated Title: Smeshannaya zadacha dlya giperbolicheskogo uravneniya

Publishing Data
Originating Agency: None
Publishing House: State Publishing House of Technical and Theoretical Literature
Date: 1953 No. pp.: 279 No. of copies: 4,000
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Others: Academician Smirnov, V. I., Mikhlin, S. G., Smolitskiy, Kh. L., and Myshkis, A. D.

Text Data
Coverage: The book mentions the two fundamental problems of linear hyperbolic equations with variable coefficients: The Cauchy problem, and the composite problem in the case of three or more variables. While the solution of the first has been analyzed by many authors, the second, which is

covered by this text, is an original attempt to present a theoretical foundation for the different methods of its solution.

The statements and wording are concise, and the attention is mainly devoted to formulae, which in some cases are assumed to be understood a priori, as are the designations and symbols.

TABLE OF CONTENTS

Smeshannaya zadacha dlya giperbolicheskogo uravneniya

Smeshannaya zadacha dlya giperbolicheskogo uravneniya AID 314 - I

		PAGE
Ch. V	Method of Analytical Approximation. Evaluation of derivatives of the first and of higher orders of the solutions of an equation. Problems of Cauchy and Goursat (analytical cases). Transformation of an equation into characteristic coordinates. Composite problem and its solution (analytical and non-analytical cases). Solution of the composite problem for spaces of the general form.	221-270
Appendix		271-276
Literature		277

Purpose: This book is apparently designed for persons with a deep mathematical knowledge.

Facilities: None, with the exception of some names mentioned in the text.

No. of Russian and Slavic References: 28 (1939-1953) of a total of 45.

Available: Library of Congress.

LADYZHENSKAYA, O.A.

Mathematical Reviews
Vol. 14 No. 11
December, 1953
Numerical and Graphical Methods.

8-10-54
LL

Ladyženskaya, O. A. On application of the method of finite differences to the solution of Cauchy's problem for hyperbolic systems. Doklady Akad. Nauk SSSR (N.S.) 88, 607-610 (1953). (Russian)

This summarizes results obtained in the author's dissertation on numerical solution of systems

$$\frac{\partial u_i}{\partial t}=\sum_{j=1}^{N}\sum_{k=1}^{m}a^k{}_{ij}(t,x,u)\frac{\partial u_j}{\partial x_k}+b_i(t,x,u)$$

with initial conditions $u_i=\phi_i(x)$, where the arguments x and u denote $x_1, \cdots, x_m$ and $u_1, \cdots, u_N$, and ϕ_i are periodic with period l in each x. If $\partial u_i/\partial t$ are approximated by $[u(t+\Delta t, x)-u(t, x)]/\Delta t$, and $\partial u/\partial x_k$ by

$$\begin{aligned}[u(t+\Delta t, \cdots, x_k+\Delta x_k, \cdots, x_m)\\ -u(t+\Delta t, \cdots, x_k, \cdots, x_m)+u(t, \cdots, x_k+\Delta x_k, \cdots, x_m)\\ -u(t, \cdots, x_k, \cdots, x_m)]/4\Delta x_k\end{aligned}$$

with $\Delta x_k=l/n$, the corresponding system of difference equations is satisfied by trigonometric polynomials u_{in}. The author asserts, without specifying hypotheses on $a^k{}_{ij}$, b_i, and ϕ_i, that as Δt and Δx tend to zero u_{in} converge uniformly to the solutions of the partial differential equation when $\Delta t/\Delta x$ is less than some constant. Other approximations to $\partial u_i/\partial x_k$ by means of central, forward, or backward differences with respect to x_k at time t are said to lead in general to divergent processes.

J. H. Giese.

LADYZHENSKAYA, O. A.

The Committee on Stalin Prizes (of the Council of Ministers USSR) in the fields of science and inventions announces that the following scientific works, popular scientific books, and textbooks have been submitted for competition for Stalin Prizes for the years 1952 and 1953. (Sovetskaya Kultura, Moscow, No. 22-40, 20 Feb - 3 Apr 1954)

Name	Title of Work	Nominated by
Ladyshenskaya, O. A.	"The Mixed Problem for Hyperbolic Equations"	Leningrad State University imeni A. A. Zhdanov

SO: W-30604, 7 July 1954

LADYZHENSKAYA, O.A.

Ladyženskaya, O. A. On a method of approximate solution of the Lavrent'ev-Bicadze problem. Uspehi Mat. Nauk (N.S.) 9, no. 4(62), 187–189 (1954). (Russian) 1-F/W

For the equation $\partial^2 u/\partial x^2 + \theta(y)\partial^2 u/\partial y^2 = 0$ with $\theta(y) = 1$ for $y > 0$, -1 for $y < 0$, the author considers the finite-difference approximation to the Tricomi problem. Instead of taking a lattice over the entire domain, a lattice over the elliptic portion above is considered. The boundary conditions are: boundary values on the arc in the elliptic portion, and $\partial u/\partial l$ given on the x-axis, where $\partial/\partial l$ is the derivative in the characteristic direction. The derivative in this direction is known from the Tricomi data. The finite-difference problem is then solved in the elliptic portion of the domain. With this solution the result for the hyperbolic part follows at once. It is shown how the above finite-difference problem is solved; estimates for the difference between this solution and the solution of the differential equation are obtained.

M. H. Protter (Berkeley, Calif.).

LPH

LADYZHENSKAYA, O. A.

Kiselev, A. A., and Ladyženskaya, O. A. On the solution of the linearized equations of a plane unsteady flow of a viscous incompressible fluid. Dokl. Akad. Nauk SSSR (N.S.) 95, 1161–1164 (1954). (Russian) 1-F/W

Les A. déterminent les écoulements plans, linéarisés (mais non stationnaires) d'un liquide visqueux dans le domaine Ω pour $t \geqq 0$; Ω est un domain borné simplement connexe ou le complémentaire d'un tel domaine (dans le second cas on admettra qui le mouvement est uniforme à l'infini). Tout revient, comme on sait, à construire dans Ω une solution régulière de

$$(1) \qquad \frac{\partial \Delta \psi}{\partial t} - \Delta^2 \psi = 0,$$

satisfaisant à

$$(2) \qquad \psi|_{t=0} = \psi_0(X)$$

où $X \in \Omega$ et où $\psi_0(X)$ est une donnée, et à

$$(3) \qquad \psi\Big|_S = \frac{\partial \psi}{\partial n}\Big|_S = 0, \quad \text{pour} \quad t \geqq 0,$$

où S est la frontière de Ω.

Les A. cherchent la solution sous forme du développement de Fourier:

$$(4) \qquad \psi = \sum_{k=1}^{\infty} c_k e^{-\lambda_k t} \varphi_k(X).$$

1

(over)

KISELEV A. A.

$$\int_{Q}\left\{\sum_{i}\frac{\partial^2\Psi}{\partial t\partial x_i}\frac{\partial\Phi}{\partial x_i}+\nu\Delta\Psi\Delta\Phi+\frac{\partial\Psi}{\partial x_2}\Delta\Psi\frac{\partial\Phi}{\partial x_1}-\frac{\partial\Psi}{\partial x_1}\Delta\Psi\frac{\partial\Phi}{\partial x_2}+f\Phi\right\}dQ=0,$$

2/2

pour toute fonction Φ deux fois continûment différentiable en x_i et satisfaisant à (3). L'A. montre d'abord qu'une telle fonction Ψ est unique. Moyennant quelques hypothèses de régularité, l'A. démontre l'existence de Ψ au moyen de la methode aux différences finies, telle qu'elle est exposée dans O. A. Ladyženskaya [Problèmes mixtes de type hyperbolique, Gostehizdat, Moscou, 1953]. Sous certaines conditions complémentaires, l'A. démontre que $\Psi\to 0$ pour $t\to\infty$ ceci uniformément dans $\bar{\Omega}$. Il reste à identifier Ψ et ψ. Ce mémoire complète heureusement les travaux classiques de Leray.

J. Kravtchenko (Grenoble).

LADYZHENSKAYA, O. A.

Ladyženskaya, O. A. On the solution of the general problem of diffraction. Dokl. Akad. Nauk SSSR (N.S.) 96, 433–436 (1954). (Russian) 1 - F/W

Consider the hyperbolic equation

$$\rho(X)\frac{\partial^2 u}{\partial t^2}=\sum_{i,j=1}^{n}\frac{\partial}{\partial x_i}\left(a_{ij}(x)\frac{\partial u}{\partial x_j}\right)+a(X,t)u+f(X,t),$$

where the a_{ij} and ρ are piece-wise smooth functions having discontinuities of the first kind only on a surface F in X-space. For this equation the problem discussed is the following: (1) Cauchy data is given for $t=0$ in some domain Ω in X-space; (2) $u=0$ on the boundary of Ω for $0\leq t\leq t_1$ (or $\partial u/\partial N=0$); (3) on the surface F: $u_{F^+}=u_{F^-}$ and $(b\partial u/\partial N)_{F^+}=(b\partial u/\partial N)_{F^-}$, where $b(X)$ is a piece-wise constant function.

A similar problem is discussed for the system

$$\frac{\partial^2 u_i}{\partial t^2}=\sum_{k=1}^{3}\frac{\partial \tau_{ik}(u)}{\partial x_k}+f_i(X,t)\quad(i=1,2,3)$$

which arises in the theory of elasticity. In this case the piece-wise smoothness of the coefficients corresponds to the junction of different materials. *M. H. Protter.*

LADYZHENSKAYA, O. A.

USSR/ Mathematics - Boundary problems

Card : 1/1

Authors : Ladyzhenskaya, O. A.

Title : Solvability of fundamental boundary problems of parabolic and hyperbolic type equations.

Periodical : Dokl. AN SSSR, 97, Ed. 3, 395 - 398, July, 1954

Abstract : It was shown that the boundary problem for cases such as the heat-conductivity and wave equations can be solved by a simple method. Then, by using simple deductions, the solutions can be applied generally to parabolic and hyperbolic equations. Two references.

Institution : A. A. Zhdanov State University in Leningrad.

Presented by : S. L. Sobolev, Academician, April 28, 1954

LADYSHENSKAYA, O.A.

Simple proof of the solvability of basic boundary value problems and problems of eigenvalues for linear elliptic equations. Vest. Len.un. 10 no.11:23-29 N '55. (MLRA 9:3)
(Eigenvalues) (Functions, Elliptic) (Differential equations)

LADYZHENSKAYA, O. A.

I - F/W

Ladyženskaya, O. A. On a method of proof of theorems on existence and uniqueness of solution of Cauchy's problem for hyperbolic equations. Dokl. Akad. Nauk SSSR (N.S.) 102 (1955), 17–20. (Russian)

HS

$$L=\frac{\partial^2}{\partial t^2}-\sum_{i,j=1}^{n}\frac{\partial}{\partial x_i}\left(a_{ij}(x,t)\frac{\partial}{\partial x_j}\right)+a_0\frac{\partial}{\partial t}+\sum_{i=1}^{n}a_i(x,t)\frac{\partial}{\partial x_i}+a(x,t)$$

1/✓

où $x\in R^n$, t=temps, $0\leq t\leq l$, les fonctions a_{ij} étant bornées sur tout compact ainsi qu'un nombre suffisant de leurs dérivées. On suppose que sur tout compact

$$\sum_{i,j=1}^{n}a_{ij}(x,t)\xi_i\xi_j\geq\alpha|\xi|^2,\ \alpha>0.$$

On cherche u solution du problème de Cauchy: $Lu=f$, $u(x,0)=\varphi_0(x)$, $u_t(x,0)=\varphi_1(x)$, u étant localement (dans $t\geq 0$) dans W^2, f, φ_0, φ_1 étant localement dans L^2, W^1, L^2 (notations des résumés précédents).

On considère Q, cone d'axe parallèle à l'axe des t, dont les surfaces latérales ont une orièntation d'espace, l'angle de la normale extérieure avec l'axe des t étant aigu. Pour $u\in W^2(Q)$, on considère $Bu=(Lu, u(x,0), u_t(x,0))$, élément de $W=L^2(Q)\times W^1(\Omega)\times L^2(\Omega)$, Ω étant la base dans $t=0$; l'image de $W^2(Q)$ par B est dense dans W (lire W au lieu de T dans le lemme 1). Or par l'inégalité de

(over)

3

Ladyzhenskaya, O.A.

l'énergie, cette image est fermée, et l'application est biunivoque (lire (7) au lieu de (9)). Donc B est un isomorphisme sur, ce qui résout le problème. Etude de la régularité de u, sous des hypothèses supplémentaires pour f, φ_0, φ_1. Procédé d'approximation de la solution à l'aide de bases de $W^2(Q)$. [Cf., aussi, K. O. Friedrichs, Comm. Pure Appl. Math. 7 (1954), 345–392; MR 16, 44.]

J. L. Lions (Nancy).

2/2

LADYZHENSKAYA, O. A.

USSR/Mathematics - Operational equations

Card 1/1 Pub. 22 - 4/59

Authors : Ladyzhenskaya, O. A.

Title : About the solution of nonstationary operator equations of various types

Periodical : Dok. AN SSSR 102/2, 207-210, May 11, 1955

Abstract : Solutions of certain types of operational equations are discussed in connection with the applicability of a new method to the solutions. This method was introduced by the author and discussed in an earlier article. Three USSR references (1953-1955).

Institution : Leningrad State University imeni A. A. Zhdanov

Presented by : Academician L. S. Sobolev, January 13, 1955

LADYZHENSKAYA, O.A.

VISHIK, M.I.; LADYZHENSKAYA, O.A.

Boundary problems for equations with partial derivatives and certain classes of operator equations. Usp.mat.nauk 11 no.6:41-97 N-D '56. (MLRA 10:3)
(Differential equations, Partial) (Operators (Mathematics))

LADYZHENSKAYA, O. A.

2

1-F\W

Ladyženskaya, O. A. On the solution of non-stationary operator equations. Mat. Sb. N.S. 39(81) (1956), 491–524. (Russian)

On cherche $u(t)$, fonction de t (temps) à valeurs dans un espace de Hilbert H, vérifiant dans un sens plus ou moins généralisé une équation différentielle

$$(*) \qquad \frac{du}{dt}+S(t)u=f,\ u(0) \text{ et } f \text{ donnés,}$$

où $S(t)$ est une famille d'opérateurs non bornés dans H, assujettis à diverses conditions de nature "elliptique". De même l'A. considère

$$(**) \qquad \frac{d^2u}{dt^2}+S(t)u=f,\ u(0),\ u'(0),\ f \text{ donnés,}$$

et les opérateurs du type Schroedinger

$$(***) \qquad \frac{du}{dt}+iS(t)u=f,\ u(0) \text{ donné,}$$

$S(t)$ auto-adjoint (sans hypothèse d'ellipticité pour l'existence). Excepté dans (***), $S(t)$ est de la forme $S_1(t)+S_2(t)$, où les $S_1(t)$ sont auto-adjoints à domaine indépendant de t (condition gênante pour les applications) et les $S_2(t)$ "petits" devant $S_1(t)$.

1/2

Ladyženskaya, O.A.

2

1-F\W

L'A. démontre des théorèmes d'existence et d'unicité
par deux méthodes: (1) Méthode d'intégrale d'energie.
Prenons par ex. (*), et $S(t)=S_1(t)$ pour simplifier; u est
solution faible de (*) dans H, dans l'intervalle $(0, l)$, si u
est de carré sommable dans $(0, l)$ à val[illegible] dans H et
vérifie $\int_0^l [(u(t), \phi'(t)-S_1(t)\phi(t))+(f(t), \phi(t))]dt+(u(0), \phi(0))$
$=0$ pour toute fonction ϕ continue de $[0, l]$ dans H, de
dérivée de carré sommable de $[0, l]$ dans H, $\phi(t) \in$ domaine
de $S_1(t)$, $t \to S_1(t)\phi(t)$ de carré sommable de $[0, l]$ dans H,
$\phi(l)=0$. Le point le plus délicat est la démonstration de
l'unicité; la méthode est alors celle déjà utilisée par l'A.
[Le problème mixte pour une équation hyperbolique,
Gostehizdat, Moscou, 1953; Dokl. Akad. Nauk SSSR
(N.S.) 102 (1955), 207–210; MR 17, 160, 161]. (2) Méthode
de différence finie. d/dt est remplacé par un quotient dif-
férentiel (et dans (***) $u(t)$ par $\frac{1}{2}[u(t-h)+u(t)]$. [Pour
d'autres résultats et méthodes, cf. Višik, Mat. Sb. N.S.
39(81) (1956), 51–148; MR 18, 215; T. Kato, J. Math.
Soc. Japan 5 (1953), 208–234; MR 15, 437; Lions, C.R.
Acad. Sci. Paris 240 (1955), 390–392; MR 16, 927; et
l'article analysé ci-dessus.]

J. L. Lions.

2/2

gmw

LADYZHENSKAYA, O.A.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/3 PG - 321
AUTHOR LADYŽENSKAJA O.A.
TITLE First boundary value problem for quasilinear parabolic equations.
PERIODICAL Doklady Akad. Nauk 107, 636-639 (1956)
reviewed 10/1956

The equation

(1) $$Lu \equiv \frac{\partial u}{\partial t} - \sum_{i,j=1}^{n} a_{ij}(x,t,u)\frac{\partial^2 u}{\partial x_i \partial x_j} + \sum_{i=1}^{n} a_i(x,t,u)\frac{\partial u}{\partial x_i} + a(x,t,u) = 0$$

with the initial and boundary conditions

(2) $$u\big|_{t=0} = \varphi_0(x)\ , \qquad u\big|_s = 0$$

is considered in the cylinder $Q_T = \Omega \times [0 \le t \le T]$. There T is arbitrary but fixed and Ω is a bounded domain which can be mapped biuniquely onto a sphere or a sphere ring, where the mapping functions $y_i(x)$ in $\bar{\Omega}$ possess bounded derivatives of second order and the functional determinant is different from zero. Let the function φ_0 possess continuous first derivatives with respect to x_k which in $\bar{\Omega}$ satisfy the Hölder condition with arbitrary exponent $\varepsilon > 0$; $\varphi_0\big|_s$ be equal zero. For all u and $(x,t) \in \bar{Q}_T$ be

$$\frac{\partial a(x,t,u)}{\partial u} \geq \beta_1 \quad \text{and} \quad |a(x,t,0)| < \beta e^{|\beta_1| t - \frac{1}{2}} .$$

Let the coefficients a_{ij}, a_i, a and a_u be continuous functions of (x,t,u) and possess first derivatives with respect to x and u which have an upper bound C_2 and let them satisfy with respect to x and u the Hölder condition with the exponent $\varepsilon_1 > 0$ and the constant C_3, if $(x,t) \in \overline{Q}_T$ and

$$|u| \leq (\max|\varphi_0| + \beta T)e^{|\beta_1| T} \equiv C_1 .$$

Let the expressions

$$\left| \frac{a_{ij}(x,t+h,u) - a_{ij}(x,t,u)}{h} \right|$$

be bounded by a constant, $\sum_{i,j=1}^{n} a_{ij} \xi_i \xi_j \geq \alpha \sum_{i=1}^{n} \xi_i^2$, $\alpha =$ const > 0 and

$\max\left|\frac{\partial a_{ij}}{\partial u}\right| \leq \frac{\alpha e \sqrt{3}}{12uC_1}$, if $(x,t) \in \overline{Q}_T$ and $|u| \leq C_1$.

To the function class $\mathfrak{M}$ there belong all functions v of $L_2(Q_T)$ which for an arbitrary fixed $t \in [0,T]$ are continuous in $\overline{\Omega}$ with respect to x, which

Doklady Akad. Nauk 107, 636-639 (1956) CARD 3/3 PG-321

possess bounded (generalized) derivatives with respect to x_k, which possess (generalized) derivatives $\frac{\partial v}{\partial t}$ and $\frac{\partial^2 v}{\partial x_i \partial x_j}$ (these derivatives shall belong to $L_2(Q_T)$) and which vanish on the lateral surface of Q_T.

Under the above assumptions and notations it is proved that the problem (1)-(2) possesses a single solution in the class $\mathfrak{M}$. For the proof a scheme of Rothe (Math.Ann 102, 4-5 (1929)) and the theorem of Schauder (Math.Zeitschr. 38, (1934)) on the solvability of the first boundary value problem for elliptic equations are used. Besides the proof bases on some estimations of the absolute amounts of the solutions of the differential-difference equations which correspond to Rothe's scheme.

Then it is shown that if some further conditions are satisfied (existence of bounded derivatives up to the third order for the coefficients, satisfaction of the Lipschitz condition) then the obtained solution is continuous in $\bar{Q}_T$ and possesses continuous derivatives inside of Q_T.

INSTITUTION: Ždanov University, Leningrad.

Oleinik, O. A. On the construction of discontinuous solutions of quasi-linear hyperbolic equations as limits of solutions of the corresponding parabolic equations when the "coefficient of viscosity" tends toward zero. Dokl. Akad. Nauk SSSR (N.S.) 111 (1956), 291–294. (Russian)

1-F/W

Es handelt sich um die Konstruktion von Lösungen des Cauchyschen Problems für die quasilineare Differentialgleichung

$$(*)\qquad \frac{\partial\psi(x,t,u)}{\partial t}+\frac{\partial\varphi(x,t,u)}{\partial x}=0,\ u|_{t=0}=u_0(x);$$

in einem beliebig großen Definitionsbereich (x, t). Dabei müssen von vornherein unstetige Lösungen zugelassen werden. In der Hydrodynamik ergänzt man in solchen Fällen (*) zweckmäßig durch ein die Viskosität zum Ausdruck bringendes Glied und versucht mit den Lösungen (u^ε) der so modifizierten Gleichung einen Grenzübergang zum viskositätsfreien Fall (u^0). — Die Verfasserin beweist zunächst die Konvergenz dieses Grenzüberganges $(\varepsilon\to 0, u^\varepsilon\to u^0)$. Sodann werden Eigenschaften der Grenzlösung gefunden, durch welche diese eindeutig bestimmt ist. In der Beweisführung wird φ zunächst von t und x unabhängig angenommen. $\varphi(u)$ wird dann zweimal stetig differenzierbar vorausgesetzt und im Intervall $[-c_1, c_1]$ der Bedingung

1/2

Ladyženskaya, O. A.

$$\varphi_{uu}(u) > a > 0$$

1-FW

unterworfen. Sowohl u_0 wie auch $\varphi, \varphi_u, \varphi_{uu}$ können durch hinreichend glatte Funktionen u_0^n approximiert werden. — Sodann wird die Gleichung

$$\frac{\partial u}{\partial t} + \frac{\partial \varphi_n(u)}{\partial x} = \varepsilon \frac{\partial^2 u}{\partial x^2}, \quad u|_{t=0} = u_0^n(x)$$

3

behandelt. Für die bekannte beschränkte Lösung u^ε gilt

$$\max_{0 \le t \le T} \frac{\partial u^\varepsilon_{n,m}}{\partial x} < c_3(T)^{n,m},$$

wobei $c_3(T)$ nicht von ε abhängt. Ferner gilt der Satz: die $u^\varepsilon_{n,m}$ konvergieren mit $\varepsilon \to 0$ und $m, n \to \infty$ gegen die Grenzfunktion $u(x, t)$. Diese Grenzlösung genügt der Identität

$$\int_{-\infty}^{+\infty}\int_0^{\infty} [u\Phi_t + \varphi(u)\Phi_x]\,dx\,dt + \int_{-\infty}^{+\infty} u_0\Phi(x, 0)\,dx = 0,$$

in welcher $\Phi(x, t)$ auf $t \geqq 0$ beschränkt und beliebig stetig differenzierbar vorgegeben werden kann. Nach einem Ergebnis von O. W. Gussewa existiert innerhalb $u^\varepsilon_{n,m}$ eine Teilfolge, die fast überall gegen u konvergiert. Zum Schluß wird noch der erwähnte Eindeutigkeitssatz bewiesen.

M. Pini (Köln).

SMW

7/2

LADYZHENSKAYA, O.A.

LADYZHENSKAYA, O.A. (Leningrad)

Constructing discontinuous solutions of quasilinear hyperbolic equations as limits of solutions of corresponding parabolic equations when the "viscosity coefficient" approaches zero. Trudy Mosk.mat. ob-va 6:465-480 '57. (MIRA 10:11)
(Differential equations, Partial)

LADYZHENSKAYA, O.A.

The principle of the limit amplitude. Usp.mat.nauk 12 no.3:161-164 My-Je '57. (MIRA 10:10)

(Operators (Mathematics))

LADYZHENSKAYA O.A.

AUTHOR: LADYZHENSKAYA O.A. 42-5-2/17

TITLE: The Difference Method in the Theory of Partial Differential Equations (Metod konechnykh raznostey v teorii uravneniy s chastnymi proizvodnymi)

PERIODICAL: Uspekhi Mat.Nauk, 1957, Vol. 12, Nr.5, pp.123-148 (USSR)

ABSTRACT: The present paper is an elaboration of the summary which the author has presented in 1956 at the Third Union Congress of Mathematicians in Moscow. The contents in essential is determined by the numerous investigations of the author. These chiefly are assertions of existence and the investigation of differential properties of the solutions. The proof of the existence of the solution of the Cauchy problem for equations of hyperbolic type is discussed in detail. The author treats the most modern methods, e.g.: the extension of Sobolev's imbedding theorems to functions defined on grids, generalized solutions, stability of the difference scheme, application of the difference methods to nonlinear problems etc. The bibliography consists of 27 essential Soviet publications, 8 of them are due to the author, and 12 foreign references.

AVAILABLE: Library of Congress

Card 1/1

1. Partial differential equations-Theory

LADYZHENSKAYA, O.A.; FIKHTENGOL'TS, G.M.

Vladimir Ivanovich Smirnov; on the occasion of his 70th birthday.
Vest. LGU 12 no.7:5-14 '57. (MLRA 10:6)
(Smirnov, Vladimir Ivanovich, 1887-)

LADYZHENSKAYA, O.A.

[redacted]

Equations ... a small parameter at the higher derivatives in linear par... differential equations (with summary in English). Vest. LGU ...7:104-120 '57. (MIRA 10:6)

(Differential equations, Partial)

LADYZHENSKAYA, O. A.

38-5-4/6

AUTHOR: KISELEV, A.A., LADYZHENSKAYA, O.A.

TITLE: On the Existence and Uniqueness of the Solution of the Non-steady Problem for a Viscous Incompressible Fluid (O sushchestvovanii i yedinstvennosti resheniya nestatsionarnoy zadachi dlya vyazkoy neszhimayemoy zhidkosti).

PERIODICAL: Izvestiya Akad.Nauk,Ser.Mat.,1957,Vol.21,Nr 5,pp.655-680,(USSR)

ABSTRACT: The present paper contains the proofs of the theorems of existence and uniqueness which were announced last year by Kiselev (Doklady Akad.Nauk 106, 27-30, 1956) for the systems

$$\frac{\partial\vec{v}}{\partial t} - \nu\Delta\vec{v} + \sum_{k=1}^{3} v_k \frac{\partial\vec{v}}{\partial x_k} = -\operatorname{grad} p + \vec{f}(x,t)$$

(1) $$\operatorname{div}\vec{v} = 0, \quad \vec{v}\Big|_s = 0, \quad \vec{v}\Big|_{t=0} = \vec{a}$$

and

$$\frac{\partial\vec{v}}{t} - \nu\Delta\vec{v} + \sum_{k=1}^{3} v_k \frac{\partial\vec{v}}{\partial x_k} = \vec{f}(x,t)$$

(2) $$\vec{v}\Big|_s = 0, \quad \vec{v}\Big|_{t=0} = \vec{a}$$

Furthermore estimations of the solutions are proved according

CARD 1/2

On the Existence and Uniqueness of the Solution of the Nonsteady Problem for a Viscous Incompressible Fluid 38-5-4/6

to Ladyzhenskaya and the differential properties of the solutions are investigated. The most essential result is the answering of the question in which functional classes (1) possesses a unique solution.

PRESENTED: By V.T. Smirnov, Academician
SUBMITTED: March 16, 1957
AVAILABLE: Library of Congress

CARD 2/2

LADYZHENSKAYA, O. A. and FADDEYEV, L. D.

"Perturbation Theory of a Continuous Spectrum."

paper submitted at International Congress Mathematicians, Edinburgh, 14 - 21 Aug 1958.

LADYZHENSKAYA, O.A.

PHASE I BOOK EXPLOITATION 1087

Moskovskoye matematicheskoye obshchestvo

Trudy, t. 7 (Transactions of the Moscow Mathematical Society, v. 7) Moscow, Fizmatgiz, 1958. 438 p. 1,500 copies printed.

Editorial Staff: Aleksandrov, P.S.; Gel'fand, I.M. and Golovin, O.N.; Ed.: Lapko, A.F.; Tech. Ed.: Yermakova, Ye.A.

PURPOSE: This book presents original articles submitted to the Moscow Mathematical Society and is intended for specialists in various fields of mathematics.

COVERAGE: Volume 7 contains 12 articles concerning problems in different fields of mathematics, including functional analysis, differential geometry and mathematical logic. All contributions in this volume are Soviet. Most of the articles deal with problems of functional analysis which reflect the present-day status and trend of this branch of mathematics.

Card 1/8

TABLE OF CONTENTS:

integral operators; 3) Operator f; 4) Hammerstein operator; 5) Operator G; 6) Differentiability of the Hammerstein operator; 7) Applications to theorems of the existence of solutions and to eigenfunctions; References.

Kornblyum, B.I. (Kiyev). Generalization of Wiener's Tauberian Theorem and Harmonic Analysis of Fast Increasing Functions 121

The basic results given in this article were presented at the April 23, 1954 session of the Moscow Mathematical Society. The article contains the following sections: 1) Introduction; 2) Theorem of Wiener type; 3) Lemmas on spaces $L(-\infty, \infty; \alpha)$ and $M(-\infty, \infty; \alpha)$; 4) Lemmas on Fourier transformations; 5) Lemmas on functions analytic in a strip; 6) Proof of theorem I; 7) Ideals I_γ^+ and I_γ^-; 8) General Tauberian Theorems; 9) Theorem of Berling type; 10) Spectrum of fast increasing functions; References.

Ladyzhenskaya, O.A. (Leningrad). Solution of the First Boundary Value Problem on the Large for Quasilinear Parabolic Equations 149

The basic results given in this article were presented at the December 18, 1956 session of the Moscow Mathematical Society. The article contains the following sections: Introduction; Ch. I. A Priori Evaluations for the

Solutions of Problems (1) and (2); 1) Evaluation of the modulus of a solution; 2) Evaluation of first derivatives of u(x,t) with respect to x_k in a closed region Ω ; 3) Evaluation in the form of integrals of u derivatives contained in the equation; 4) Evaluation of the second order derivatives of u with respect to x_k in the interior of a region Ω; 5) Evaluation of the third order derivatives of u with respect to x_k; 6) Evaluation of derivatives D^2_{tx} u, D^4_x u and D^3_{tx} 2 u;

Ch. II. Theorems on Existence and Uniqueness of a Generalized Solution of the Boundary Value Problem; 1) Construction of Approximate Solutions; 2) Evaluation of | grad u_h (x,tp)|; 3) Evaluation of D^2_x u_h and $u_{\bar{h}t}$ in the form of integrals; 4) Proof of the existence and uniqueness theorem of a generalized solution; Ch. III. Investigation of Differential Properties of a Generalized Solution. The Existence of a Classical Solution; References.

Ryzhkov, V.V. Conjugate Systems on Multidimensional Spaces 179

The basic results given in this article were presented at the March 20, 1956 session of the Moscow Mathematical Society. This article contains

Card 4/8

the following sections: Introduction; Ch.I. Conjugate Systems; 1) Designations and basic definitions; 2) Differential equation defining conjugate systems; 3) Condition for complete stratification of a conjugate system; 4) n-conjugate systems; Ch. II. Completely Stratifiable Conjugate Systems; 5) Conjugate Systems with one multidimensional component; 6) Completely stratifiable conjugate systems with several multidimensional components; 7) General remarks on complete stratifiable conjugate systems; References.

Fage, M.K. (Chernovitsy). Operationally Analytic Functions of One Independent Variable [Functions Defined by an Ordinary Linear Differential Operator L of an Arbitrary Order With Continuous Coefficients] 227
The basic results given in this article were presented at the October 30, 1956 session of the Moscow Mathematical Society. The article contains the following sections: Introduction; 1) L-bases; 2) L-analytic polynomials; 3) Taylor's L-formula; 4) Taylor's L-series; 5) L-holomorphic functions; 6) L-analytic functions. Uniqueness theorem; 7) Regularly convergent sequences of L-analytic functions; 8) Operator with analytic coefficients; 9) Local equivalency of operators of an equal order; 10) Cauchy problem in the region of double operationally holomorphic functions; References.

1087

Transactions of the Moscow Mathematical (Cont.)

Levitan, B.M. Differentiation of Eigenfunction Expansion of the Schrödinger Equation 269

The basic results given in this article were presented at the October 4, 1955 session of the Moscow Mathematical Society. The article contains the following sections: Introduction; 1) Solution of Cauchy problem; 2) Evaluation for arbitrary eigenfunctions; 3) Evaluation of derivatives of eigenfunctions in the case of an infinite region; 4) Differentiation of eigenfunction expansion; 5) The case of $q(x) \to +\infty$ at $|x| \to \infty$; References.

Men'shov, D.Ye. Limit Functions of a Trigonometric Series 291

The basic results given in this article were presented at the April 16, 1957 session of the Moscow Mathematical Society. The article contains the following sections: 1) Introduction. [Basic definitions and formulation of three theorems]; 2) [Preliminary remarks, definitions and auxiliary theorems needed to prove theorem II. Proof of theorem II[; 3) [Definitions and lemmas needed to prove theorem III]; 4) [Proof of Theorem III;] 5) Derivation of theorem I from theorems II and III; References.

Grayev, M.I. Unitary Representations of Real Simple Lie Groups 335

This article was presented at the January 20, 1956 Session of the All-Union Conference on Functional Analysis and its Applications. The article contains the following sections: Introduction; 1) G_{pq} group; parameters and an invariant measure of G_{pq} group;

Card 6/8

2) Generalized linear elements and transitive manifolds; 3) Discrete series of representations of type 1; 4) Irreducibility of representations of a discrete series; 5) Traces of representations of a discrete series; 6) Indiscrete basic series of unitary representations of $G_{p,q}$ group; References.

Muchnik, A.A. Solution of Post's Reducibility Problem and of Certain Other Problems of the Theory of Algorithms. I. Basic results of the article were presented at the October 16, 1956 session of the Moscow Mathematical Society. The article contains the following sections: Introduction; Ch. I. Functional Representation of Partially Recursive Operators; 1) Cortege and quasi-cortege; 2) Functional representations of operators; 3) Universal partially recursive operator; 4) Calculation [solution] of M - [Medevedev] problems; Ch.II. Decision Problems of Enumerable Sets; I) Semilattices $\mathfrak{A}(p)$; 2) Post's reducibility problem; References. 390

Muchnik, A.A. Isomorphism of Systems of Recursively Enumerable Sets With Effective Properties 407

Card 7/8

Transactions of the Moscow Mathematical (Cont.) 1087

The basic results given in this article were presented at the December 17, 1957 session of the Moscow Mathematical Society. The article contains the following sections: 1) Introduction; 2) On the correspondence (reducibility) of systems of sets; 3) Effective inseparability; 4) Quasi-effective properties; References.

Raykov, D.A. Completely Continuous Spectra of Convex Spaces 413
Basic results given in this article were presented at the December 3, 1957 session of the Moscow Mathematical Society. The article contains the following sections: Introduction; 1) Preliminary information and agreements of a general character; 2) Preliminary information on projective limits; 3) Preliminary information on inductive limits; 4) Spaces of type (S); 5) Spaces of type ($\bar{S}$); 6) Spaces of type ($\bar{S}'$); 7) Preliminary information from the theory of duality; 8) Conjugate mappings; 9) Duality of classes ($\bar{S}$) and ($\bar{S}'$); 10) Nondegenerated spectra; References.

AVAILABLE: Library of Congress

Card 8/8 LK/fal
2-24-59

AUTHOR: LADYZHENSKAYA, O.A. 43-7-8/18

TITLE: On Integral Estimates Convergence of Approximate Methods and the Functional Solutions of Linear Elliptic Operators (Ob integral'nykh otsenkakh, skhodimosti priblizhennykh metodov i resheniy v funktsionalakh dlya lineynykh ellipticheskikh operatorov)

PERIODICAL: Vestnik Leningradskogo Universiteta, Seriya Matematiki, Mekhaniki i Astronomii, 1958, Nr 7 (2), pp 60-69 (USSR)

ABSTRACT: The present paper contains some partially little connected corollaries and possible generalizations of the well-known publications of the author [Ref.1-4]. The greatest part of these completions is already contained in the modern Russian papers published meanwhile.
10 Soviet and 1 foreign references are quoted.

SUBMITTED: 25 November 1957
AVAILABLE: Library of Congress
Card 1/1 1. Integrals 2. Functions-Theory

LADYZHENSKAYA, O.A. (Leningrad)

Solving the first boundary problem on the whole for quasi-linear parabolic equations. Trudy Mosk.mat. ob-va 7:149-177 '58.

(MIRA 11:8)

(Differential equations, Partial)

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000928420005-1"

AUTHORS: Bakel'man, I.Ya, Birman, M.Sh., and Ladyzhenskaya, O.A. SOV/42-13-5-11/15

TITLE: Solomon Grigor'yevich Mikhlin (on the Occasion of his 50th Birthday) (Solomon Grigor'yevich Mikhlin (K pyatidesyatiletiyu so dnya rozhdeniya))

PERIODICAL: Uspekhi matematicheskikh nauk, 1958, Vol 13, Nr 5, pp 215-222 (USSR)

ABSTRACT: This is a short biography and a summary of the scientific activity of S.G. Mikhlin with a list of his publications (1932-1957) containing 78 papers. There is a photo of Mikhlin.

Card 1/1

LADYZHENSKAYA, O.A.

Nonstationary Navier-Stokes equations. Vest.LGU 13 no.19:9-18 '58.
(MIRA 12:1)
(Functional analysis)

16(1)

AUTHOR: Ladyzhenskaya, O.A.

SOV/43-58-19-2/16

TITLE: On Instationary Navier-Stokes Equations (O nestatsionarnykh uravneniyakh Nav'ye-Stoksa)

PERIODICAL: Vestnik Leningradskogo universiteta, Seriya matematiki, mekhaniki i astronomii, 1958, Nr 19(4), pp 9 - 18 (USSR)

ABSTRACT: The author considers the problem

$$L\vec{u} = \frac{\partial \vec{u}}{\partial t} + \varepsilon \Delta^2 \vec{u} - \nu \Delta \vec{u} + u_k \frac{\partial \vec{u}}{\partial x_k} + \text{grad } p = \vec{f}$$

$$\text{div } \vec{u} = 0 , \quad \vec{u}\Big|_S = \Delta \vec{u}\Big|_S = 0 , \quad \vec{u}\Big|_{t=0} = \vec{u}^0(x)$$

where $\vec{u} = (u_1, u_2, u_3)$, $\varepsilon > 0$, $\nu > 0$, S is the sufficiently smooth boundary of the bounded domain Ω, $\vec{f} \in L_2(Q_T)$, $\vec{u}^0 \in W_2^2(\Omega)$, $Q_T = \Omega \times [0,T]$, $\text{div } \vec{u}^0 = 0$.

The author shows that under these conditions the problem possesses a unique solution $\vec{u}$, p in Q_T. Several estimations

Card 1/2

hold for the solution, e.g.

$$\int_{\Omega} \vec{u}^{\,2}(x,t)dx + \int_0^t \int_{\Omega} \left[\varepsilon(\Delta \vec{u})^2 + \nu \sum \vec{u}^2_{x_i} \right] dx\, dt \leqslant c_1 ,$$

where c_1 only depends on $\int_{\Omega} \vec{u}^2(x,0)dx$ and $\int_0^t \int_{\Omega} \vec{f}^2\, dx\, dt$.

Under certain conditions the solution tends for $\varepsilon \to 0$ to the unique boundary value which is the generalized solution of the boundary value problem for the Navier-Stokes equations.

In a second theorem the author proves the existence of a unique solution of the analogue of the Navier-Stokes boundary value problem proposed by Leray [Ref 1].
A third theorem is merely stated and says that the mentioned analogous problem is uniquely solvable "in the large" (in the sense of [Ref 5]).
There are 8 references, 3 of which are Soviet, 1 German, 3 French, and 1 Swedish.

SUBMITTED: July 4, 1958

AUTHOR: Ladyzhenskaya, O.A. (Leningrad) 39-45-2-2/7

TITLE: On Instationary Operator Equations and Their Application to Linear Problems of Mathematical Physics (O nestatsionarnykh operatornykh uravneniyakh i ikh prilozheniyakh k lineynym zadacham matematicheskoy fiziki)

PERIODICAL: Matematicheskiy sbornik, 1958, Vol 45, Nr 2, pp 123-158 (USSR)

ABSTRACT: In her earlier papers [Ref 1-3] the author developed a new method for the proof of the solvability of instationary boundary value problems and she proved the solvability of the Cauchy problem for the operator equations

(1) $\frac{du}{dt} + S(t)u = f(t)$ and (2) $\frac{d^2u}{dt^2} + S(t)u = f(t)$,

where $S(t)$ are linear generally not bounded operators in the Hilbert space H. In the first chapter of the present paper it is shown that from the solvability of the Cauchy problem for (1) and (2) there follows the solvability of the Cauchy problem and the boundary problems for equations of parabolic, hyperbolic and of the Schrödinger type as well as for strongly parabolic and hyperbolic systems, respectively. In the second chapter the equation

Card 1/2

On Instationary Operator Equations and Their Application to Linear Problems of Mathematical Physics 39-45-2-2/7

$$(3) \qquad Au \equiv S_1(t)\frac{d^2u}{dt^2} + S_2(t)\frac{du}{dt} + S_3(t)u = f$$

is considered with the aid of the difference method of the author [Ref 3]. It is investigated which difference schemes converge for (3). In the third chapter the method of the continuation with respect to the parameter (compare author [Ref 5]) is somewhat simplified. Altogether the paper contains 12 partially announced theorems.
There are 19 references, 17 of which are Soviet, 1 Swedish and 1 American.

SUBMITTED: December 12, 1956

1. Operators (Mathematics) 2. Topology--Applications 3. Hyperbolic equations--Theory

Card 2/2

AUTHOR: ~~Ladyzhenskaya, O.A.~~ 20-120-5-7/67

TITLE: On the Differential Properties of Generalized Solutions of Some Multidimensional Variation Problems (O differentsial'nykh svoystvakh obobshchennykh resheniy nekotorykh mnogomernykh variatsionnykh zadach)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 120, Nr 5, pp 956-959 (USSR)

ABSTRACT: Given the functional $I(u) = \int_{\Omega} F(u_1, \dots, u_n) dx$, where $dx = dx_1 \dots dx_n$, $u_i = \frac{\partial u}{\partial x_i}$, Ω a bounded domain of the n-dimensional space and F a two times continuously differentiable function satisfying certain additional conditions. The function u(x) is sought for which I(u) has a minimum; this u(x) is denoted as the generalized solution. The unique solvability of this variation problem has already been proved by Morrey [Ref 2]. The author shows that under certain assumptions on the function class to which there belongs u, u has generalized second derivatives u_{ij} in Ω and almost everywhere it satisfies the equation $F_{ij}u_{ij} = 0$. Further it is shown that the integral

Card 1/2

On the Differential Properties of Generalized Solutions of Some Multidimensional Variation Problems 20-120-5-7/67

$$\int_{\Omega_1} (|u|_1^{p-2} + 1) \sum_{ij} u_{ij}^2 \, dx \leqslant \text{const if } \Omega_1 \text{ lies entirely in } \Omega, \; p \geqslant 2$$

and $|u(x)|_1 = \sqrt{\sum_{k=1}^{n} u_k^2(x)}$. Under further assumptions u(x) is continuous and satisfies the Lipschitz condition. Corresponding reversion theorems are valid too.

There are 8 references, 4 of which are Soviet, 1 Italian, 2 American and 1 German.

ASSOCIATION: Leningradskoye otdeleniye matematicheskogo instituta imeni V.A. Steklova Akademii nauk SSSR (Leningrad Section of the Mathematical Institute imeni V.A.Steklov of the Academy of Sciences of the USSR)

PRESENTED: February 10, 1958, by V.I.Smirnov, Academician

SUBMITTED: January 30, 1958

1. Mathematics

Card 2/2

AUTHOR: Ladyzhenskaya, O.A. and Faddeyev, L.D. SOV/20-120-6-5/59

TILE: On the Perturbation Theory of the Continuous Spectrum (K teorii vozmushcheniy nepreryvnogo spektra)

PERIODICAL: Doklady Akademii nauk SSSR, Vol 120, Nr 6, pp 1187-1190 (USSR), 1958

ABSTRACT: Let K be an integral operator and let L_o denote the multiplication with the independent variable. The investigation of the spectrum of $L = L_o + \varepsilon K$ led Friedrichs [Ref 1,2] to the consideration of the integral equation

$$(1)\quad r(\lambda,\mu)=k(\lambda,\mu) + i\pi\varepsilon k(\lambda,\mu)r(\mu,\mu) + \varepsilon P\int\frac{k(\lambda,\sigma)r(\sigma,\mu)}{\mu-\sigma}.$$

The solubility of (1) was proved by Friedrichs for small ε only. The authors prove that (1) is solvable for an arbitrary finite ε, and they present some properties of the spectrum of L without restriction to small ε.
There are 2 non-Soviet references, 1 of which is German, and 1 American.

Card 1/2

On the Perturbation Theory of the Continuous Spectrum SOV/20-120-6-5/59

ASSOCIATION: Leningradskoye otdeleniye matematicheskogo instituta imeni V.A. Steklova (Leningrad Section of the Mathematical Institut imeni V.A. Steklov of the Academy of Sciences of the USSR)

PRESENTED: February 17, 1958, by V.I. Smirnov, Academician

SUBMITTED: February 10, 1958

1. Perturbation theory 2. Spectroscopy

Card 2/2

10(6)

AUTHOR: Ladyzhenskaya, O. A. SOV/20-123-3-12/54

TITLE: The Solution "In the Whole" of the Boundary Problem for the Equations of Navier-Stokes in the Case of Two Spatial Variables (Resheniye "v tselom" krayevoy zadachi dlya uravneniy Nav'ye - Stoksa v sluchaye dvukh prostranstvennykh peremennykh)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 3, pp 427-429 (USSR)

ABSTRACT: The author investigated (within the region Ω of the variation of $x = (x_1, x_2)$) the system of Navier (Nav'ye)-Stokes (Stoks) equations $\vec{v}_t - \nu\Delta\vec{v} + \sum_{k=1}^{2} v_k \vec{v}_{x_k} = -\text{grad } p + \vec{f}(x,t)$, $\text{div } \vec{v} = 0$ for the functions $\vec{v} = (v_1(x,t), v_2(x,t))$ and $p(x,t)$ under the boundary and initial conditions $\vec{v}|_S = 0$, $\vec{v}|_{t=0} = \vec{a}(x)$ $(\text{div } \vec{a} = 0)$.
In this paper, the following theorem is proved: The theorem characterized by the above equations can be solved "In the whole"

Card 1/2

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000928420005-1"

The Solution "In the Whole" of the Boundary Problem for the Equations of Navier-Stokes in the Case of Two Spatial Variables SOV/20-123-3-12/54

(i.e. for any $t \geqslant 0$ for any values of the Reynolds (Reynol'ds) number in the initial instant of time and for any $\vec{f}$) if the integrals $\int\limits_{\Omega} \vec{a}^2 dx$, $\int\limits_{\Omega} \left[\vec{v}_t(x,0)\right]^2 dx$, $\int\limits_0^t \int\limits_{\Omega} \left[f^2 + (\vec{f}_t)^2\right] dx dt$ are finite. The problem of the existence "In the whole" may be reduced to the finding of an apriori estimate of the integral $\int\limits_0^t \int\limits_{\Omega} (\vec{v}_t)^2 dx\, dt + \int\limits_{\Omega} \sum\limits_{k=1}^{2} v_k^4(x, \vec{t}) dx$ or of $\max |\vec{v}|$. The proof of this theorem is given step by step. The author thanks A. O. Gel'fond for proving an inequation. There are 3 references, 1 of which is Soviet.

ASSOCIATION: Leningradskoye otdeleniye Matematicheskogo instituta im. V. A. Steklova Akademii nauk SSSR (Leningrad Branch of the Mathematical Institute imeni V. A. Steklov of the Academy of Sciences, USSR)

PRESENTED: September 29, 1958, by V. I. Smirnov, Academician

SUBMITTED: September 25, 1958

Card 2/2

LADYZHENSKAYA, O.A.

16(1) PHASE I BOOK EXPLOITATION SOV/2660

Vsesoyuznyy matematicheskiy s"yezd. 3rd, Moscow, 1956

Trudy. t. 4: Kratkoye soderzhaniye sektsionnykh dokladov. Doklady inostrannykh uchenykh (Transactions of the 3rd All-Union Mathematical Conference in Moscow. vol. 4: Summary of Sectional Reports. Reports of Foreign Scientists) Moscow, Izd-vo AN SSSR, 1959. 247 p. 2,200 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Matematicheskiy institut.

Tech. Ed.: G.N. Shevchenko; Editorial Board: A.A. Abramov, V.G. Boltyanskiy, A.M. Vasil'yev, B.V. Medvedev, A.D. Myshkis, S.M. Nikol'skiy (Resp. Ed.), A.G. Postnikov, Yu. V. Prokhorov, K.A. Rybnikov, P. L. Ul'yanov, V.A. Uspenskiy, N.G. Chetayev, G. Ye. Shilov, and A.I. Shirshov.

PURPOSE: This book is intended for mathematicians and physicists.

COVERAGE: The book is Volume IV of the Transactions of the Third All-Union Mathematical Conference, held in June and July 1956. The book is divided into two main parts. The first part contains summaries of the papers presented by Soviet scientists at the Conference that were not included in the first two volumes. The second part contains the text of reports submitted to the editor by non-Soviet scientists. In those cases when the non-Soviet scientist did not submit a copy of his paper to the editor, the title of the paper is cited and, if the paper was printed in a previous volume, reference is made to the appropriate volume. The papers, both Soviet and non-Soviet, cover various topics in number theory, algebra, differential and integral equations, function theory, functional analysis, probability theory, topology, mathematical problems of mechanics and physics, computational mathematics, mathematical logic and the foundations of mathematics, and the history of mathematics.

Korobeynik, Yu. F. (Rostov-na-Donu). Certain problems of the theory of infinite systems of linear integral equations and their applications to mathematical physics 26

Kostomarov, D.P. (Moscow). On the asymptotic behavior of the solutions of systems of linear differential equations of the first order in the neighborhood of an irregular singular point 27

Lavruk, B.R. (L'vov). On one type of boundary value problems for elliptic systems of linear differential equations of the second order 27

Ladyzhenskaya, O.A. (Leningrad). The first boundary value problem for quasilinear parabolic equations and the Cauchy problem for quasilinear hyperbolic equations in the large 29

Leritin, B.M. (Moscow). On the expansion in eigenfunctions of the Schrödinger equation 32

Card 7/34

LADYZHENSKAYA, O.A.

16(0) P.2 PHASE I BOOK EXPLOITATION SOV/2960

Moskovskoye matematicheskoye obshchestvo

Trudy, t. 8 (Transactions of the Moscow Mathematical Society, Vol 8) Moscow, Fizmatgiz, 1959. 518 p. Errata slip inserted. 2,050 copies printed.

Ed.: A.F. Lapko; Tech. Ed.: S.S. Gavrilov; Editorial Board: P.S. Aleksandrov, I.M. Gel'fand, and O.N. Golovin.

PURPOSE: This book is intended for mathematicians and theoretical physicists.

COVERAGE: This book contains a collection of articles by leading Soviet mathematicians on problems in pure and applied mathematics. All articles were written in 1957 and 1958. Among the topics discussed are: analytic - operater functions, function spaces, nonstationary plane flow of a viscous non-compressible liquid, root spaces, products of groups representations, ordinary and partial differential equations, 3rd and 4th order linear equations, homogeneous spaces, spectral theory of operators, and generalized random processes. References accompany each article.

Card 1/3

Transactions of the Moscow Mathematical (Cont.) SOV/2960

TABLE OF CONTENTS:

Card 2/3

Transactions of the Moscow Mathematical (Cont.) SOV/2960

AVAILABLE: Library of Congress

Card 3/3

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SMIRNOV, Vladimir Ivanovich, akademik. Prinimali uchastiye: LADYZHENSKAYA, O.A., prof.; BIRMAN, M.S.; AKILOV, G.P., red.; POL'SKAYA, R.G., tekhn.red.

[Course in higher mathematics] Kurs vysshei matematiki. Moskva, Gos.izd-vo fiziko-matem.lit-ry. Vol.5. 1959. 655 p. (MIRA 12:10)

(Mathematics)

LADYZHENSKAYA, O.A. (Leningrad)

Solution on the whole to Cauchy's problem for nonstationary plane flow of viscous incompessible fluids. Trudy Mosk.mat. ob-va 8:71-82 '59. (MIRA 13:2)
(Fluid dynamics)

16(1)

AUTHOR: Ladyzhenskaya, O.A. SOV/42-14-3-3/22

TITLE: Investigation of the Navier-Stokes Equations in the Case of Stationary Motion of an Incompressible Fluid

PERIODICAL: Uspekhi matematicheskikh nauk, 1959,Vol 14,Nr 3,pp 75-98(USSR)

ABSTRACT: In the domain Ω with boundary S the author investigates the solvability of the Navier-Stokes equations for a stationary motion of a viscous incompressible fluid. On the basis of the results of Odqvist and Leray the author shows that the posed problem possesses a solution in the large for a finite as well as for an infinite domain Ω. The consideration is carried out in two functional spaces, in $W_2^1(\Omega)$ and in $C^1(\Omega)$. The consideration in $W_2^1(\Omega)$ has the advantage that the existence of the generalized solution follows from very general properties of the corresponding operators and that with respect to S and the forces of inertia f only minimum assumptions are necessary. In $C^1(\Omega)$ the author proves the existence of the classical solution under assumption of

Card 1/2

4

Investigation of the Navier - Stokes Equations SOV/42-14-3-3/22
in the Case of Stationary Motion of an Incompressible Fluid

certain conditions of smoothness for S and f . For the exterior problem the author puts u_{∞} = const on account of simplicity. She shows that the internal and external stationary problem of hydromechanics possesses at least one solution for all values of the Reynolds number. Contents: Chapter I. Generalized solutions. Chapter II. Classical solutions.
The author mentions S.G. Kreyn, I.I. Vorovich, V.I. Yudovich, S.L. Sobolev.
There are 9 references, 3 of which are Soviet, 3 German, 2 French, and 1 American.

SUBMITTED: April 1, 1958

Card 2/2

ALEKSANDROV, A.D.; AKILOV, G.P.; ASHNEVITS, I.Ya.; VALLANDER, S.V.; VLADIMIROV, D.A.; VULIKH, B.Z.; GABURIN, M.K.; KANTOROVICH, L.V.; KOLBINA, L.I.; LOZINSKIY, S.M.; LADYZHENSKAYA, O.A.; LINNIK, Yu.V.; LEBEDEV, N.A.; MIKHLIN, S.G.; MAKAROV, B.M.; NATANSON, I.P.; NIKITIN, A.A.; POLYAKHOV, N.N.; PINSKER, A.G., SMIRNOV, V.I.; SAFRONOVA, G.P.; SMOLITSKIY, Kh.L.; FADDEYEV, D.K.

Grigorii Mikhailovich Fikhtengol'ts; obituary. Vest. LGU 14 no.19: 158-159 '59. (MIRA 12:9)
(Fikhtengol'ts, Grigorii Mikhailovich, 1888-1959)

10(2)

AUTHORS: Ladyzhenskaya, O.A. and Solonnikov, V.A. SOV/20-124-1-5/69

TITLE: On the Solvability of Non-stationary Problems of Magnetic Hydrodynamics (O razreshimosti nestatsionarnykh zadach magnitnoy gidrodinamiki)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 1, pp 26-28 (USSR)

ABSTRACT: The authors consider a viscous incompressible liquid in a magnetic field. For the determination of the velocity, pressure, electric and magnetic potential they use the original enlarged Maxwell system of equations with the initial conditions $v(0) = v_0$, $H(0) = H_0$ and with different boundary conditions. Three boundary value problems are formulated and their solvability in the large is proved under relatively weak conditions. The final results are about the same as for the Navier-Stokes equations in [Ref 1]. The authors propose a scheme for the solution of the problems. There is 1 Soviet reference.

ASSOCIATION: Leningradskoye otdeleniye matematicheskogo instituta imeni V.A.Steklova AN SSSR (Leningrad Section of the Mathematical Institute imeni V.A. Steklov AS USSR)

Card 1/2

On the Solvability of Non-stationary Problems of Magnetic Hydrodynamics SOV/20-124-1-5/6

PRESENTED: August 11, 1958, by V.I. Smirnov, Academician

SUBMITTED: August 8, 1958

Card 2/2

10(4)

AUTHOR: Ladyzhenskaya, O. A. SOV/20-124-3-15/67

TITLE: The Steady Motion of a Viscous Incompressible Fluid in a Pipe (Statsionarnoye dvizheniye vyazkoy neszhimayemoy zhidkosti v trube)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 551-553 (USSR)

ABSTRACT: In two earlier papers (Refs 1,2) the problem of a steady flow round bodies of finite dimensions with given $\vec{u}_\infty = \overrightarrow{const}$ in infinity is investigated. Here the existence of at least one laminary motion in the case of arbitrary Reynolds numbers was proved. In the present paper it is proved that the same applies to an infinite tube of arbitrary diameter. I. Leray (Ref 1) during his Leningrad stay attracted the author's attention to this problem. Ω is assumed to be an unlimited range of the Euclidian space $x = x(x_1,x_2,x_3)$ consisting of the three parts Ω_1, Ω_2, and Ω_3. The parts Ω_1 and Ω_3 are parts of cylindrical tubes of arbitrary diameters D_1 and D_3, which extend into infinity. Ω_2 is the middle part of the tube Ω,

Card 1/3

which connects Ω_1 and Ω_3 with each other. $\vec{a}_1(x)$ and $\vec{a}_3(x)$ are assumed to be the steady motions corresponding to cylindrical tubes which are unlimited on both sides and have the cross sections D_1 and D_3 (which do not vary along the axes of these tubes). To these solutions $\vec{a}_1(x)$ and $\vec{a}_3(x)$ of the nonlinear steady problem of the hydrodynamics of viscous fluids there correspond the pressures $p_1(x)$ and $p_3(x)$, which have constant gradients directioned along the axes of the tubes. The problem to be solved by the present paper consists in finding (within Ω) the solution $\vec{u}(x)$, $p(x)$ of the system of equations of Navier-Stokes $-\nu\Delta\vec{u} + u_k\vec{u}_{x_k}$ = grad $p + \vec{f}$, div $\vec{u} = 0$, which on the boundary S of the tube Ω, must obey the condition $\vec{u}|_S = 0$, and for which, besides $\vec{u} \to \vec{a}_1$, $|x| \to \infty$, $x \in \Omega_1$, $\vec{u} \to \vec{a}_3$, $|x| \to \infty$, $x \in \Omega_3$ holds. Next, the Hilbert space $H(\Omega)$ is defined. The following theorem holds: The problem consisting

Card 2/3

of the aforementioned equations and secondary conditions has at least one generalized solution $\vec{u}$ for an arbitrary $\vec{f}$, which determines the linear functional $\int\limits_{\Omega} \vec{f}\,\vec{\Phi}dx$ with respect to $\vec{\Phi}$ in $H(\Omega)$. This function will be all the smoother, the smoother $\vec{f}$ and the boundary S will be. If especially $\vec{f}$ and the derivatives up to the second order of the boundary functions satisfy Gelder's condition, the generalized solution will be a classical one. Next, the proof of this theorem is outlined. This proof can also be generalized. There are 2 references, 1 of which is Soviet.

ASSOCIATION: Leningradskoye otdeleniye Matematicheskogo instituta im. V. A. Steklova Akademii nauk SSSR (Leningrad Department of the Mathematics Institute imeni V. A. Steklov of the Academy of Sciences, USSR)

PRESENTED: September 15, 1958, by V. I. Smirnov, Academician

SUBMITTED: September 11, 1958

LADYZHENSKAYA, O. A. (Leningrad)

"On the Solvability of Various Problems of Hydrodynamics and Magnetohydrodynamics for a viscous incompressible Fluid."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27Jan - 3 Feb 1960

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AUTHORS: Golovkin, K. K., Ladyzhenskaya, O. A.

TITLE: Solutions of a nonstationary boundary value problem for the Navier-Stokes equations

PERIODICAL: Akademiya nauk SSSR. Matematicheskiy institut. Trudy, v. 59, 1960, 100-114

TEXT: The authors consider the Navier-Stokes equations

$$\left.\begin{aligned} &\vec{v}_t + v_k \vec{v}_{x_k} - \Delta \vec{v} + \operatorname{grad} p = \vec{f} \\ &\operatorname{div} \vec{v} = 0 \end{aligned}\right\} \qquad (1)$$

with the boundary and initial conditions:

$$\vec{v}\,|_S = 0;\ \vec{v}\,\big|_{t=0} = \vec{a}(x);\ (\operatorname{div} \vec{a} = 0) \qquad (2)$$

in a domain $Q_1 = \Omega \times [0 \le t \le 1]$. Ω is bounded by S, $\vec{f}(x,t)$ belongs to $L_2(Q_1)$, $\vec{a}(x)$ to $L_2(\Omega)$. A vector $\vec{v}(x)$ is called a "week solution" of the problem (1) - (2), if it is quadratically summable over Ω for any t from

Card 1/3

25611
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B112/B202

Solutions of a nonstationary ...

[0, T]; if $\vec{v}_{x_k}$ is from $L_2(Q_1)$, and if the condition:

$$\int_{Q_t}\left[\vec{v}\vec{\phi}_t + \vec{v}_{x_k}\vec{\phi}_{x_k}\right]dxdt = \int_{\Omega}\vec{a}\vec{\phi}\Big|_{t=0}dx = \int_{Q_t}\vec{\phi}\left[-v_k\vec{v}_{x_k} + \vec{f}\right]dxdt \quad (5)$$

is fulfilled for any smooth solenoidal vector $\vec{\phi}(x,t)$ vanishing for $t = T$. The present paper is based on the following principal theorem: if $\vec{f}(x,t)$ is from $L_2(Q_1)$ and $\vec{a}(x)$ from $L_2(\Omega)$ every weak solution: $\vec{v}$, p of the problem (1)-(2) has derivatives: $\vec{v}_t$, $\vec{v}_{x_i x_j}$; p_{x_i} which are from $L_{5/4}(Q_1)$. This theorem is proved by a theory of nonstationary hydrodynamic potentials which had been developed by K. K. Golovkin (Akademiya nauk SSSR. Matematicheskiy institut. Trudy. v. 59, 1960, 87 - 99). S. G. Mikhlin is mentioned. There are 10 references: 6 Soviet-bloc and 3 non-Soviet-bloc. The most important reference to English-language publications reads as follows: O. A. Ladyzhenskaya, Solution "in the Large" of the Nonstationary Boundary Value Problem for the Navier-Stokes System with Two Space Variables. Communications on Pure and Applied Mathematics XII,

Card 2/3

25611

Solutions of a nonstationary... S/517/60/059/000/004/006
B112/B202

(1959), 403-425.

Card 3/3

S/124/61/000/012/007/038
D237/D304

AUTHORS: Ladyzhenskaya, O. A., and Solonnikov, V. A.

TITLE: Solving some non-stationary magnetohydrodynamic problems for a viscous non-compressible fluid

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 12, 1961, 7, abstract 12B40 (Tr. Matem. in-ta. AN SSSR, 1960, 59, 115-173)

TEXT: The results obtained earlier by the authors are presented in detail (Dokl. AN SSSR, 1959, 124, no. 1, 26-28-RZhMekh, 1960, no. 8, 9907). Boundary problems of three types are formulated, corresponding to different distributions of the regions filled with dielectric, solid conductor and fluid. The classical presentation is replaced by a generalized one, i.e., equations of continuity and boundary conditions are replaced by the necessity for the sought functions to belong to some Hilbert spaces, while the remaining equations are replaced by integral identities,

Card 1/2

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C 111/ C 333

AUTHORS: Ladyzhenskaya, O. A., Ural'tseva, N. N.

TITLE: On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 6, pp. 1330-1333

TEXT: On the results of this paper it was partially reported:
1.) In autumn 1959 in the seminary of V. J. Smirnov in Leningrad,
2.) in autumn 1959 in the surveying lecture at the Leningrad Mathematical Society, 3.) in December 1959 in the seminary of J. G. Petrovskiy in Moscow.

Let: E_k a k-dimensional Euclidean space, Ω a bounded domain with the boundary S; Ω' a rigorously internal subdomain of Ω ; $C_{l\,\alpha}(\Omega)$, $W'_m(\Omega)$ be defined as in (Ref.1,2); $O_l(\Omega)$ the class of the functions $u(x)$, $x \in \Omega$ for which the derivatives of $(l - 1)$rst order possess a first differential, where the derivatives up to the l-th order are bounded on each compact part of Ω ; $\mu(|u|)$ a positive monotonely increasing (function of $|u|$), $\nu(|u|)$ a positive monotonely decreasing function of $|u|$; m a number > 1.

Card 1/8

87391

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

Let Ω satisfy the condition (A), if there are constants $a > 0$ and θ from $(0,1)$, such that for every sphere $K(\varrho)$ with radius $\varrho \leq a$ and center on S it holds: mes $[K(\varrho) \cap \Omega] \leq (1-\theta)$ mes $K(\varrho)$.

§ 1. Let the condition (B) say that 1.) every differentiation of the functions $a_{ij}(x,u,p_k)$, $a(x,u,p_k)$, $a_i(x,u,p_k)$, $F(x,u,p_k)$ with respect to p_k reduces its orders of growth in p at least by 1, while the differentiation to x_k and u does not enlarge these orders and 2.) the inequalities

$$(5) \quad \nu(|u|)(p^2+1)^{m/2} \leq a_{ij}(x,u,p_k)\, p_i p_j \leq \mu(|u|)(p^2+1)^{m/2}$$

$$(6) \quad |a(x,u,p_k)| \leq \mu(|u|)(p^2+1)^{m/2}, \quad p = \left(\sum_{k=1}^{n} p_k^2\right)^{1/2}$$

hold.

Theorem 1: Let u(x) be the solution of the equation

87391
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C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

(3) $L_1(u) \equiv a_{ij}(x,u,u_{x_k})\, u_{x_i x_j} + a(x,u,u_{x_k}) = 0$

assume that it belongs to the class $C_3(\Omega) \cap C_1(\bar{\Omega})$ and satisfies

(2) $u|_S = \varphi(s)$.

For $a_{ij}(x,u,p_k)$, $a(x\ u\ p_k) \in C_1(\Omega \times E_1 \times E_n)$ let (B) and

(7) $\nu(|u|)(p^2 + 1)^{m/2-1} \leqq a_{ij}(x,u,p_k)\, \xi_i\, \xi_j \leqq \mu(|u|)(p^2+1)^{m/2-1}$

be satisfied for $\sum \xi_i^2 = 1$. Then the author estimates $\max\limits_{\Omega} |u_{x_i}|$ by $\max\limits_{\Omega} |u|$ and $|\varphi|_{C_{2,0}(S)}$, if the oscillation of $u(x)$ is small in Ω and S belongs to $C_{2,0}$.

Theorem 2: If the conditions of theorem 1 are satisfied except those for S and φ, then $\max\limits_{\Omega'} |u_{x_i}|$ is estimated by $\max\limits_{\Omega} |u|$ for every $\Omega' \subset \Omega$.

Card 3/8

87391

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

Theorem 3: Modification of theorem 1 under renunciation of the small oscillation of u(x).

Theorem 4 and 5 give similar statements on the estimations of the norms of solutions for the equation

$$(4)\quad M_1(u) \equiv \frac{\partial}{\partial x_i}\left(a_i(x,u,u_{x_k})\right) + a(x,u,u_{x_k}) = 0$$

where in theorem 4 the author assumes that

$$(9)\quad a_i(x,u,p_k)\, p_i \geq \nu(|u|)\, p^m,\; p \gg 1 \;.$$

§ 2. Theorem 6 is the statement of existence for the problem

$$(10)\quad M_\tau(u) \equiv \tau M_1[u] + (1-\tau)\, M_0(u) = 0 \;,\; u\Big|_S = \tau\, \varphi(s),$$

where

Card 4/8

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

$$M_o(u) = \frac{\partial}{\partial x_i} F^o_{u_{x_i}} - F^o_u, \quad F^o(x,u,u_{x_k}) = \Big(\sum_i u^2_{x_i} + 1 \Big)^{m/2} + \mu^2.$$

Theorem 7: For (3) let (B) and (7) be satisfied for n = 2, where m = 2 is assumed without restriction of generality. Let

$| a(x,u,p_k)| \leqq \mu(|u|)(p^2 + 1)^{1-\varepsilon}$, $\varepsilon > 0$ be instead of (6).

Then the problem $L_\tau(u) \equiv \tau L_1(u) + (1-\tau)(\Delta u - u) = 0$, $u|_S = \tau\varphi(s)$ possesses at least one solution $u(x,\tau)$ from $C_{2,\alpha}(\Omega) \cap C_{3,\alpha}(\Omega)$ for all $\tau \in [0,1]$, if the values $u(x,\tau)$ are uniformly bounded for all such possible solutions $u(x,\tau)$. The functions a_{ij}, a must be belong to $C_{1,\alpha}$, $\varphi \in C_{2,\alpha}$, $S \in C_{2,\alpha}$, Ω homeomorphic to the circle.

§ 3. The variation problem

Card 5/8

87391

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

(1) $\inf I(u) = \inf \int_\Omega F(x,u,u_{x_k})\, dx$, $x = x_1, \ldots, x_n)$
is considered under the condition (2). Assume that $F(x,u,p_k)$ has the order of growth $m > 1$ in p and that every differentiation of F to p_k reduce this order at least by 1, while the order does not increase by differentiation with respect to x_n and u. Let

$$F(x,u,p_k) \geq \nu_1(|u|)\, p^m$$

(11)
$$F_{p_i p_j}(x,u,p_k)\, \xi_i\, \xi_j \geq \nu_2(|u|)(p^2+1)^{\frac{m-2}{2}} \sum \xi_i^2$$
$$F_{p_i}(x,u,p_k)\, p_i \geq \nu_3(|u|)\, p^m , \quad p \gg 1 .$$

Theorem 8: Let u be a generalized solution from $W_m^1(\Omega)$ of the "conditional" variation problem (1) - (2), i. e. of the problem completed by the condition that all comparison functions do not exceed a certain constant: $M \geq \max_S |u|$. The solution u belongs

Card 6/8

87391

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

to $C_{o,\alpha}(\Omega)$, if $F \in C_1$ and if the conditions

$$
(12) \quad \begin{aligned} &\mu(|u|)p^m \geq F_{p_i}(x,u,p_k)\, p_i \geq \nu(|u|)\, p^m, \quad p \gg 1 \\ &|F_u(x,u,p_k)| \leq \mu(|u|)\, p^m \end{aligned}
$$

are satisfied. Under the same assumptions for F every bounded function $u \in W'_m(\Omega)$, for which $\delta I(u) = 0$, belongs to $C_{o,\alpha}(\Omega)$. If Ω satisfies the condition (A) and if $\varphi \in C_1$, then $u \in C_{o,\alpha}(\bar{\Omega})$.

Theorem 9. Under the conditions for F formulated at the beginning of § 3 every bounded generalized solution u(x) of the variation problem (1) - (2) from the class $W'_m(\Omega)$ belongs to $C_{k,\alpha}(\Omega)$, if $F \in C_{k,\alpha}$, $k \geq 3$ and $\Delta I(u) = I(u+\eta) - I(u) > 0$ for every sufficiently small local variation $\eta(x)$. If, however, $S \in C_{1,\alpha}$, $\varphi \in C_{1,\alpha}$, $2 \leq 1 \leq k$, then $u \in C_{1,\alpha}(\bar{\Omega}) \cap C_{k,\alpha}(\Omega)$.

Card 7/8

87391

S/020/60/135/006/005/037
C 111/ C 333

On the Variation Problem and Quasilinear Elliptic Equations With Multiple Independent Variables

Finally the author gives two lemmata generalizing the lemma due to E. de Giorgi (Ref.4).

S. N. Bernshteyn is mentioned by the author.

There are 4 references: 2 Soviet, 1 Italian and 1 American.

[Abstracter's note: (Ref.1) is the book of C. Miranda: Partial Differential Equations of Elliptic Type].

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Card 8/8

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[Mathematical aspects of the dynamics of a viscous incompressible fluid] Matematicheskie voprosy dinamiki viazkoi neszhimaemoi zhidkosti. Moskva, Izd-vo fiziko-matem. lit-ry, 1961. 203 p. (MIRA 15:2)

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AUTHORS: Ladyzhenskaya, O. A., Ural'tseva, N. N.

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Two problems are considered: 1.) the first boundary value problem for quasilinear elliptic equations

$$\sum_{i,j=1}^{n} a_{ij}(x,u,u_{x_k})\, u_{x_i x_j} + a(x,u,u_{x_k}) = 0 \qquad (1)$$

and 2.) the differential properties of the generalized solutions

Card 1/13